



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/847,479	05/02/2001	Jeffrey J. Brown	FIS920010077US1	6231

21254 7590 05/21/2003
MCGINN & GIBB, PLLC
8321 OLD COURTHOUSE ROAD
SUITE 200
VIENNA, VA 22182-3817

EXAMINER

BARRECA, NICOLE M

ART UNIT	PAPER NUMBER
----------	--------------

1756

DATE MAILED: 05/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

5

Office Action Summary

Application N .

09/847,479

Applicant(s)

BROWN ET AL.

Examiner

Nicole M. Barreca

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 March 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. The restriction requirement is withdrawn. Claims 1-20 are pending in this application.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1, 7, 11, and 17 recite "a critical dimension of 100 nm or less". This claim does not meet the description requirement because the phrase "or less" has no lower limit and causes the claim to read outside of the disclosed range. While the claims are supported for some dimensions less than 100 nm, such as 75 nm (p.10 of specification), the claims are not supported for all critical dimensions less than 100 nm. See MPEP 2163.05, III.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

Art Unit: 1756

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 2, 4-7, 9-11, 13-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Yang (US Patent 6,372,651).

6. Yang discloses a method for trimming a photoresist pattern line for memory gate etching. A resist mask pattern 74 is formed overlying antireflective coating 72 on a semiconductor wafer. The sidewalls of the resist mask pattern are etched or trimmed to reduce the line pattern width. Following the etching of resist mask pattern lines the antireflective (SiON) coating layer 72 is etched using the trimmed resist pattern as an etching mask in a plasma etch chamber in a gas mixture of CHF₃, CF₄, O₂ and Ar, at percentages of 10, 20, 10 and 50. (i.e. CHF₃ 10 sccm, CF₄ 20 sccm, O₂ 10 sccm, Ar 50 sccm). Layers 70 (polysilicon cap), 68 (silicide), 66 (second polysilicon), 64 (oxide-nitride-oxide) and 62 (first polysilicon) are successively etched using the antireflective layer as a mask (col.5, 5-31). This method enables the formation of line widths less than or equal to 0.18 microns (<180 nm). (col.3, 49-54).

7. Claims 1, 2, 7, 11-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Ng (2002/0142252).

The applied reference has a common assignee with the instant application.

Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in

Art Unit: 1756

the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

8. Ng discloses a method for polysilicon trimming. Polysilicon substrate 201 has antireflection coating (ARC) 202 and resist pattern 203 formed thereon having a first critical dimension. In step 320 the structure is lithographically patterned. Then in step 330 the ARC 202 is etched using an O₂ containing gas to performing trimming of the first critical dimension to obtain a second critical dimension. The second critical dimension is about 10-50 nm smaller than the first critical dimension [0038]-[0041].

Figure 2C illustrates examples of different first critical dimensions and the final line widths resulting after the trimming process was performed for different lengths of time, including dimensions of 100 nm, 90 nm and 70 nm [0048]. The conditions for the trim etch include a pressure of about 5-50 mT for about 5-40 seconds. The etching rate is within a specific limit and is dependent on the amount of resist and ARC being used [0042]. The method improves nested-isolated offset which resulting in greater across chip line width variation (ACLV) [0047]. The second embodiment (fig.4) illustrates an example wherein the resist pattern is nested and isolated. The polysilicon conductor can be etched using a surface charging technique using Ar/NF₃ in order to correct for the offset between nested and isolated features [0055-0059]. See also the claims.

9. Please note that claims 13-20 are product by process claims. The only product limitation in claims 13-16 is that the product be an electrical device or circuit. The only product limitation in claims 17-20 is in claim 17 which requires that at least one circuit chip has a critical dimension of 100 nm or less. Therefore, since claim 17 is anticipated

Art Unit: 1756

by Yang and by Ng, and dependent claims claim 18-20 only provide further process limitations, claims 18-20 are also anticipated by Yang and by Ng. See MPEP 2113 which states that if the product in the product-by-process claims is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by another process.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ng as applied to claims 1 or 7 above, and further in view of Kim (US 6,233,388) and Jang (US Patent 5,940,719).

12. Ng uses oxygen in the trim etch and does not disclose that the trim etch is an oxygen and nitrogen plasma etch. Kim teaches that when an inert gas, such as nitrogen, is used together with oxygen, the etch rate can be more easily controlled (col.4, 13-17). It would have been obvious to one of ordinary skill in the art to add nitrogen to the oxygen trim etching gas in the method of Ng because Kim teaches that this will allow the etch rate to be more easily controlled.

Ng is silent on the flow rate and power and does not disclose a flow ratio of oxygen to nitrogen between 0.25 and 2.5 or a RF power of 50-200 Watts. Jang teaches that etch recipes factors including the kinds, ratio and pressures of the etch gases and

Art Unit: 1756

power are varied depending on the etch time (col.5, 44-47). It would have been obvious to one of ordinary skill in the art that the flow gas ratio of oxygen to nitrogen, the RF power and pressure of the trim etch, could be varied depending on the etch time desired because Jang teaches that the kinds, ratio and pressures of the etch gases and power of the etching gases is a result-effective variable which will depend on the etch time. It would have been within the ordinary skill of one in the art to use a flow ratio of oxygen to nitrogen of between 0.25 and 2.5 and to use a RF power of 50-200 Watts for the trim etch, if the desired etch time required such an etch recipe. See *In re Boesch*.

Response to Arguments

13. The 35 USC 102 and 103 rejections over Tao, Yang (6107172) and Chen have been withdrawn in response to the applicant's amendments. Applicant's arguments with respect to these references have been considered but are moot in view of the new ground(s) of rejection.

14. Applicant's arguments filed 3/7/03 with respect to Yang (6372651) have been fully considered but they are not persuasive. While the applicant argues that Yang does not disclose a critical dimension of 100 nm or less, the examiner directs the applicant to col.3, lines 48-54, where it is disclosed that the method forms line widths less than 0.180 microns or 180 nm.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

Art Unit: 1756

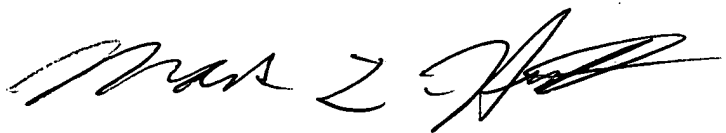
§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 703-308-7968. The examiner can normally be reached on Monday-Thursday (8:00 am-6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

5/16/03
nm